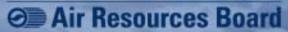
Public Workshop Technology Assessment on Climate Change Emissions from Light-Duty Vehicles

Discussion of Results from TIAX Study

April 20, 2004 Sacramento, CA





Alternative Fuel Vehicles

- Impact on climate change emissions
- Well-to-wheels analysis
- Cost and marketability issues
- Technology improvements identified for conventional vehicles not included



Alternative Fuels

- Electricity
- Ethanol
- Compressed Natural Gas
- Liquid Petroleum Gas
- Plug-in hybrid



Electricity

Large emissions benefit ~ 50 percent

Marketability and cost issues

 Small city and neighborhood vehicles more viable but have smaller emission benefits



Ethanol

- 35 percent reduction relative to gasoline
- Current flexible fuel vehicles use gasoline due to lack of infrastructure
- Dedicated fuel vehicles necessary to ensure emission benefits



Compressed Natural Gas

- Emissions benefit ~ 30 percent
- Modest refueling infrastructure
- Home refueling key to larger scale commercialization



Liquified Petroleum Gas

30 percent reduction relative to gasoline

- Fleet use in California: 33,000 vehicles
 - central refueling

Most cost-effective alternative fuel



Plug-in HEV

- ~50 percent reduction relative to gasoline
- 20 mile all-electric range



CO₂ Comparison

	Total CO2 g/mile	Lifetime Tons	Percent Reduction
Convention vehicle	409	91	0
Electricity	205	48	-50
Ethanol	250	58	-36
CNG	280	65	-28
LPG	275	64	-29
Plug-in HEV	195	46	-50



Incremental Cost

	Cost Increment	Lifetime NPV
Convention vehicle	\$0	\$0
Ethanol	\$0	(\$2,412)
CNG	\$3,600	(\$6,039)
LPG	\$700	(\$3,342)
Plug-in HEV	\$5,700	\$691



Adjustment Factors

Fuel	CO2 Adjustment Factor		
<u>Emissions</u>			
CNG	1.03		
LPG	0.89		
E85, Corn	0.76		
Fuels with no direct CO2 Emissions			
Electricity, Grid NG	643 g/kWh		





Staff Conclusions

- Alternative fueled vehicles available in limited quantities
- Substantial reductions in climate change emissions possible from wider use
- Incremental costs and fuel availability hurdles to commercialization